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Dated 15 December 2004

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1/77

02DEC03 E856437-3 D02835
P01/7700 0.00-0327896.7

Request for grant of a patent

(see the notes on the back of this form. You can also get an explanatory leaflet from the Patent Office to help you fill in this form)

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The Patent Office

Cardiff Road
Newport
South Wales NP10 8QQ

1. Your reference — PRW/P201355

2. Patent application number *(The Patent Office will fill in this part)* — 28 NOV 2003 — 0327896.7

3. Full name, address and postcode of the applicant *(underline all surnames)*

   Westok Limited.
   Calder Vale Road
   Horbury Junction
   Horbury
   WF4 5ER

   08684953002
   Patents ADP number *(if you know it)*

   If the applicant is a corporate body, give the country/state of its incorporation — GB

4. Title of the invention — STRUCTURAL BEAM WITH OPENINGS

5. Name of your agent *(if you have one)* — **URQUHART-DYKES & LORD LLP**

   "Address for service" in the United Kingdom to which all correspondence should be sent *(including the postcode)*

   Tower North Central
   Merrion Way
   Leeds LS2 8PA
   United Kingdom

   Patents ADP number *(if you know it)* — ~~1644004~~ 08857138001

6. If you are declaring priority from one or more earlier patent applications, give the country and the date of filing of the or of each of these earlier applications and *(if you know it)* the or each application number

Country	Priority application number *(if you know it)*	Date of filing *(day/month/year)*

7. If this application is divided or otherwise derived from an earlier UK application, give the number and the filing date of the carlier application

Number of earlier application	Date of filing *(day/month/year)*

8. Is a statement of Inventorship and of right to grant of a patent required in support of this request? *(Answer 'Yes' if:*
   a) any applicant named in part 3 is not an inventor, or
   b) there is an inventor who is not named as an applicant, or
   c) any named applicant is a corporate body.
   See note (d))

   Yes

9. Enter the number of sheets for any of the following items you are filing with this form. Do not count copies of the same document

Continuation sheets of this form	0
Description	4
Claim(s)	0
Abstract	0
Drawing(s)	1

10. If you are also filing any of the following, state how many against each item.

Priority documents	-
Translations of priority documents	-
Statement of Inventorship and right to grant of a patent *(Patents Form 7/77)*	-
Request for preliminary examination and search *(Patents Form 9/77)*	-
Request for substantive examination *(Patents Form 10/77)*	-
Any other documents *(Please specify)*	-

11. I/We request the grant of a patent on the basis of this application.

Signature **URQUHART DYKES & LORD** Date 27/11/2003

12. Name and daytime telephone number of person to contact in the United Kingdom **P R WHARTON – 0113 245 2388**

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STRUCTURAL BEAM WITH OPENINGS

This invention relates to improvements in structural beams of the type having a web located between two flanges, in which the web is not continuous, but has apertures therein.

In our European patent publication number 0324206 there is described a method of manufacturing such beams, which comprises the steps of taking a universal beam, making a cut generally longitudinally along the web thereof, separating the cut halves of the beam, displacing the halves with respect to one another and welding the halves together, characterised in that:

a second cut is made along the web, the path differing from the first path of the first cut, the two paths being defined rectalinear sections lying on alternative sides of a longitudinal centre line of the web and at least partly curvalinear sections joining the closest ends of adjacent rectilinear sections. The use of the double cutting approach of this publication allows shapes to be produced which were hitherto impossible. In particular, beams can be produced for circular or oval shaped holes, which may be desirable for aesthetic or other reasons. Previous forms of beam, known as castellated beams, produced by a single cut, could only have hexagonally shaped holes. Beams of this general type will hereafter be referred to as "cellular beams".

The depth of such cellular beams is greater than the depth of the beam from which it is cut, and in the normal method of manufacture, essentially no metal is excised during the cutting process, the depth of the finished cellular beam bears a fixed relationship to the depth of the beam from which it is cut. Since steel beams are supplied in a limited number of sizes, it therefore follows that cellular beams produced from them are normally also in a limited number of sizes. For some applications this can be a problem.

The inventions seeks to provide a method of producing a cellular beam having a depth less than those produced in accordance with the above mentioned European patent publication number 0324206.

According to the present invention, there is provided a method of producing a structural beam with openings located in the web, which comprises the steps of taking a universal beam, making a cut generally longitudinally along the web thereof, making a second cut along the web on a path differing from the first path of the first cut, separating the cut halves of the beam, and welding the halves together, characterised in that:

a width of material or ribbon is defined by the two cuts of an amount equal to the desired reduction in depth of the finished cellular beam.

The ability to be able to specify exactly the depth of the finished cellular beam is useful in a number of end uses. For example, in multi-storey office and car park construction, the floor depth is frequently dictated by client preference and planning constraints. To achieve a precise floor depth using the traditional cellular beam is often impractical. However, a beam produced in accordance with the invention can be made to the exact depth required with the maximum efficiency of steel useage.

While it is possible to achieve predetermined and precise floor depths using welded plate beams with profiled web openings, such beams are not as strong as those produced in accordance with the invention from a section, i.e. extruded, universal beam.

In a particular embodiment of the invention, it is possible actually to reduce the depth of the finished cellular beam to less than that of the universal beam from which it is produced. This has similar advantages in use in buildings where the number of floors is to be maximised within a given overall height for cost or planning constraints.

Another advantage of the method of the invention is that the cut along the web can be such that any shape and position of openings can be obtained. This is not possible with the cellular beams hitherto produced, which must have regularly spaced openings along their entire length of constant shape and size. Once again, the beam produced by the method of the invention differs from welded beams by the use of an extruded section beam as the starting point which produces a superior strength product and moreover can reduce steel wastage.

The invention will be described further, by way of example, with reference to the accompanying drawings, in which:

Figures 1(a) and1(b) correspond to figures 1(a) and 1(b) in the patent publication number 0324206 and illustrate the finished cellular beam and cut pattern respectively;

Figures 2(a) and 2(b) correspond to figures 1(a) and 1(b) and illustrate the present invention; and

Figures 3(a) and 3(b) correspond to figures 1(a) and 1(b) and illustrate a second embodiment of the invention.

Referring to the drawings, and in particular Figure 1, in the method of EP patent publication number 0324206, a cellular beam (10) has flanges (12,14) between which extends a web (16). The beam (10) is produced from a universal beam (figure 1(b)), having a depth *d* which is two-thirds of the depth of the depth *D* of the finished beam (10) shown in figure 1(a). The web (16) of the universal beam is cut along two continuous cutting lines (18,20) and the material (22,23) between the lines (18,20) is removed.

After the two cuts have been formed, the two halves of the beam are separated and one is moved longitudinally relative to the other in order to juxtapose the rectilinear sections (24,26) which are welded together to produce the finished cellular beam (10) illustrated in figure 1(a).

Turning now to Figure 2, and using like numerals for like parts, the cuts (18,20) are spaced further apart from one another and define a ribbon (28) of material therebetween. The beams are separated and moved longitudinally relative to one another and the adjacent rectilinear portions (24,26) welded together as before. The thickness of the beam in accordance with the invention is less than the thickness *D* produced in accordance with the above mentioned European patent publication by the amount "x", the width of the narrowest portions of the ribbon (28). As "x" may be varied at will, the thickness of the finished beam may be specified precisely.

In an alternative embodiment illustrated in Figure 3, the ribbon (28) contains a great deal more material and, since the rectilinear portions (24,26) are already opposite one another, the two halves of the beam do not need to be moved longitudinally relative to one another before welding. This produces a beam of thickness $d - x$, i.e. less than the thickness of the original beam (10) by the amount "x" in figure 1(b). That is, in this embodiment, the cellular beam produced is actually of less depth than the universal beam from which it is produced. In certain circumstances, this construction of beam is preferable to producing a cellular beam from the smaller initial universal beam, either because such is not available or because the section thickness (of the web and/or flanges) of a smaller beam is not sufficient to meet the strength requirements needed.

While the method has been described in relation to the attaching together of the two halves of a single cut universal beam, it is possible to use halves from different cut universal beams to produce asymmetrical cellular beams. The benefits of asymmetric cellular beams are well established in the construction industry.

The process of the invention allows cellular beams to be produced of high strength and of a thickness tailored to the end use.

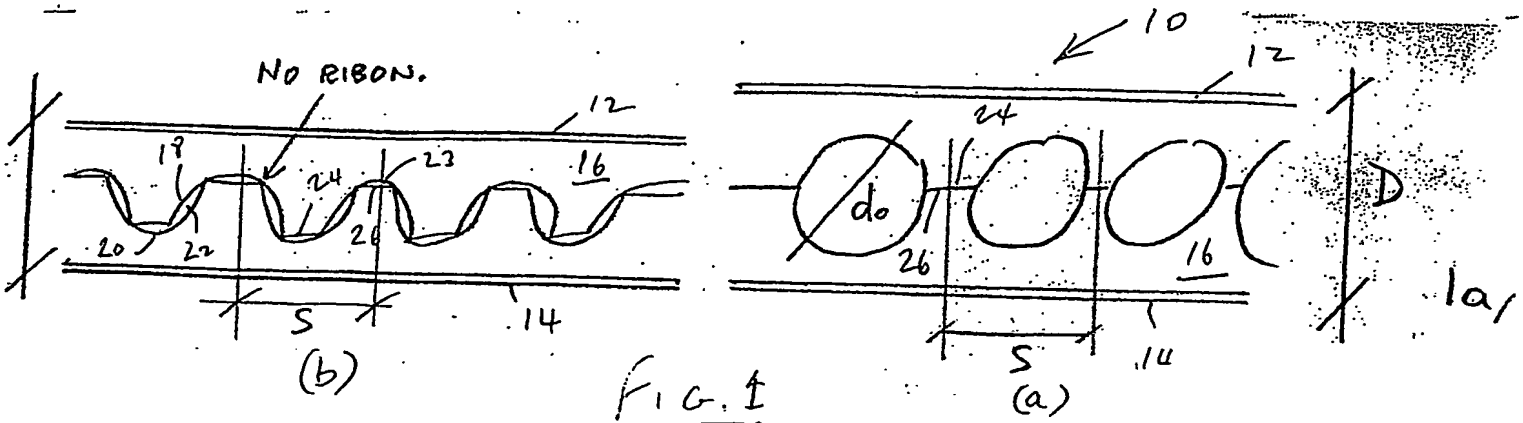

FIG. 1

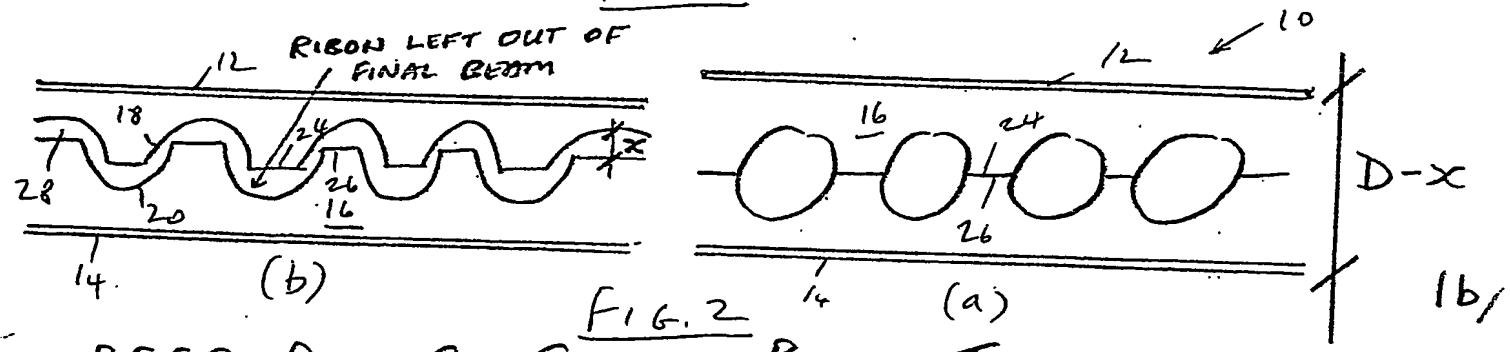

FIG. 2

RCCB - RIBON CUT CELLULAR BEAM. THE FINAL DEPTH OF 1b, IS SHALLOWER THAN BEAM 1a, BY DIMENSION 'x', WHERE x IS THE DEPTH OF THE 'RIBON'.

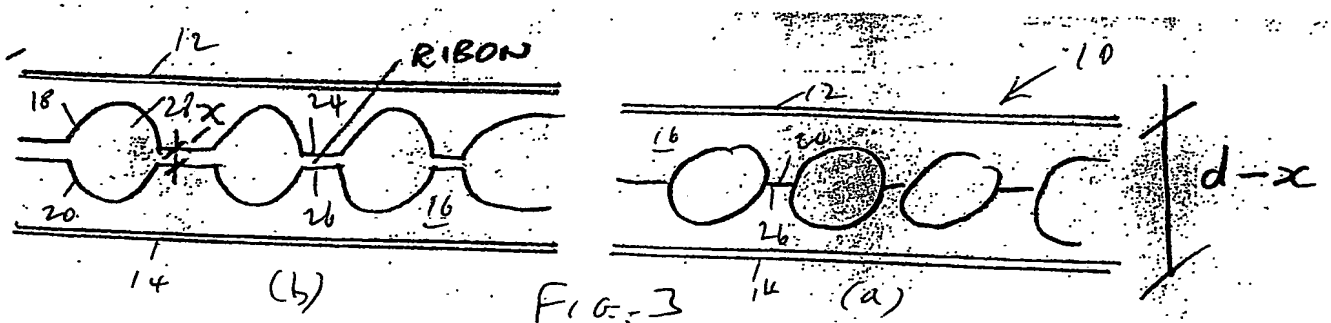

FIG. 3

RDCB REDUCED DEPTH CELLULAR BEAM.

THE FINISHED DEPTH OF BEAM, 3b, IS d-x, WHERE d IS THE ORIGINAL SECTION DEPTH LESS THE DEPTH OF 'RIBON' x, CUT FROM BEAM 3a.

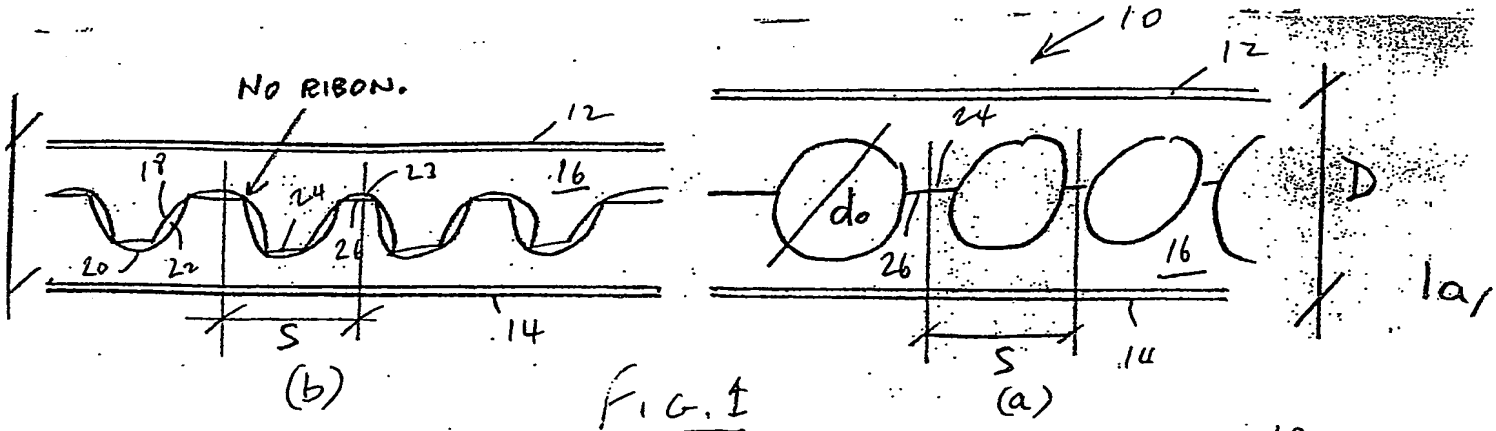

FIG. 1

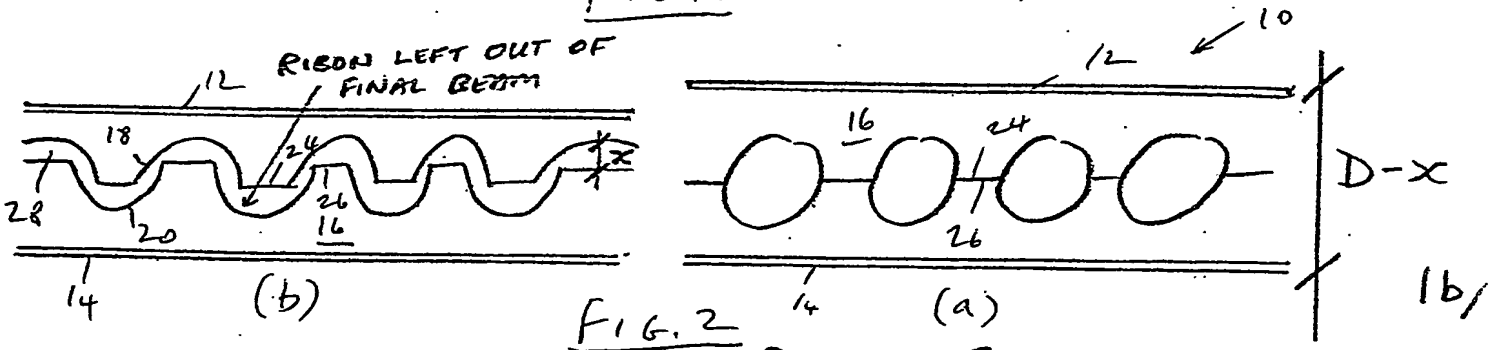

FIG. 2

RCCB - RIBON CUT CELLULAR BEAM. THE FINAL DEPTH OF 1b, IS SHALLOWER THAN BEAM 1a, BY DIMENSION 'x', WHERE x IS THE DEPTH OF THE 'RIBON'.

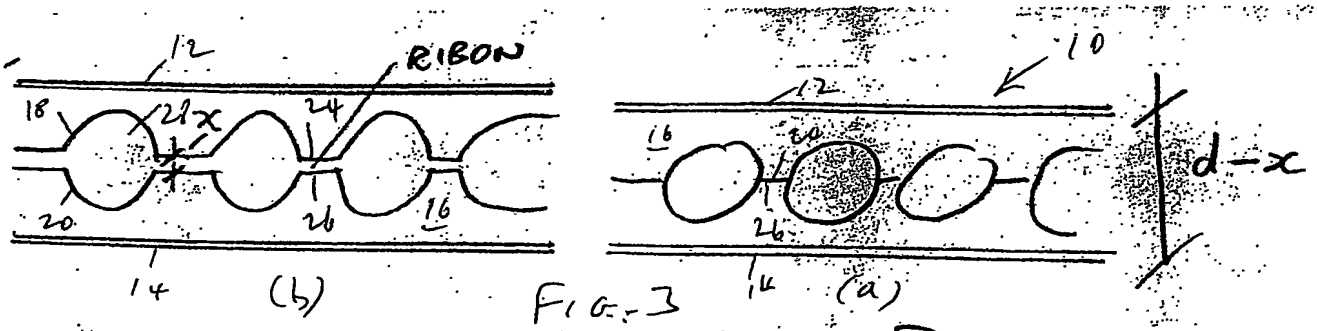

FIG. 3

RDCB REDUCED DEPTH CELLULAR BEAM.

THE FINISHED DEPTH OF BEAM, 3b, IS d-x, WHERE d IS THE ORIGINAL SECTION DEPTH LESS THE DEPTH OF 'RIBON' x, CUT FROM BEAM 3a.

Spare